REMARKS

Claims 1, 18, 19, 42, 62, and 63 have been amended. New claims 64 and 65 have been added.

Applicants request that the amendments be entered.

No new subject matter has been added.

Application as Published:

Applicants note that in ¶0079 of the application as published, "CCI" appears as "CCl." That is, "I" appears as lower-case "l." CCI means co-channel interference. The ¶0079 of the application as published corresponds to ¶0080 on page 15 of the application as filed.

Claim Amendments:

Claims 1, 18, 19, 42, 62, and 63 have been amended to claim the subject matter in a more comprehensive manner and to recite claimed features with a better clarity. The amendments are supported, for example, by ¶¶0027 (page 7), 0047 (page 10), 0054 (page 11), and 0080-0082 (page 15) of the specification as filed.

New claims 64 and 65 are supported, for example, by FIG. 1 and accompanying description.

Claim Rejections under 35 U.S.C. § 103(a):

A. Claims 1 and 42:

The Examiner has rejected claims 1, 29-33, 36, 38, 41-43, 48-52, 55, 57, and 60 under 35 U.S.C. § 103(a) as being unpatentable over a paper titled "Reduced-state MIMO Sequence Estimation for Edge Systems" by Zhang *et al.* of record (hereinafter, Zhang) in view of US Patent Publication No. 20050111596 to Olsson *et al.* (hereinafter, Olsson). The Applicants respectfully traverse the rejections.

Zhang discloses a Joint Reduced State Sequence Estimator (JRSSE) for a

MIMO (Multiple Input Multiple Output) system. The JRSSE incorporates the set-partitioning principle to obtain a reduced state trellis and is the space-time extension of a Reduced State Sequence Estimator for a SISO (Single Input Single Output) system. (Zhang Abstract).

Olsson discloses a method/apparatus that detects the impairment in the received signal and employs the structure in the receiver that is designed for that purpose. Preferably, the method/apparatus detects the interferer modulation and employs the structure in the receiver that is designed for that purpose. The detection is preferably performed using a quality measure, *e.g.*, the residual errors after channel estimation or SNR (signal-to-noise ratio) estimates after channel estimation. Olsson involves preferably hypothesis tests, threshold schemes, or schemes where the threshold is adapted according to one of the measures. The operations in the receiver are preferably that it selects between a powerful interference rejection method and a conventional receiver or that it selects between a powerful interference rejection method and a less powerful interference rejection method, or a combination thereof. (Olsson Abstract).

Zhang does not disclose, *inter alia*, "performing on a corresponding complex composite base band received signal, comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, a joint detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection" as specifically recited in claim 1 reproduced below:

> 1. A method, comprising:
> receiving a wireless communication signal by a receiver from each of at least two spatially separated transmit antennas associated with at least one transmitter or from at least two transmitters;
> performing on a corresponding complex composite base band received signal, comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, a joint detection in

> inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection of real and imaginary parts of signals, from a single receive antenna branch or from a plurality of receive antenna branches; and
>
> determining at least one of the following:
>
> whether operation of the receiver is in a first mode in which an interfering signal is directed to a different receiver; and
>
> whether operation of the receiver is in a second mode in which a desired signal and an interfering signal are processed by the receiver. (Emphases added).

Applicants' disclosure is directed, for example, to a device and method for an I/Q MIMO detection framework is a practical means to realize interference cancellation (IC) gains when GMSK, 8PSK signals interfere with each other in synchronous GSM/EDGE networks, thereby providing coverage, capacity, and throughput gain. Further, the presented algorithm applies to a high data rate system concept, in which multiple signals are transmitted from the base station (BTS) through multiple antennas. (Abstract). The instant specification is also directed, for example, to single antenna reception and joint detection of at least two signals having same or different modulation as described in ¶0027 on page 7 of the application as filed.

Zhang does disclose a MIMO receiver structure, in FIG. 1 of Zhang, showing joint channel estimator, JRSSE, and joint decoder blocks. Applicants believe that FIG. 1 is a high-level, symbolic diagram, *e.g.*, intended for computer simulation, showing a MIMO receiver in a vague manner because, for example, a receive filter is followed immediately by a joint channel estimator. As a person having ordinary skill in the art would appreciate, it is possible to have an analog receive filter in such a receiver at the point shown in FIG. 1 of Zhang but the joint channel estimation must be performed in the digital domain. Usually, even the receive filter is of a digital IIR or FIR variety. There is no indication of a host of digital detection and/or signal processing steps or blocks required before joint channel estimation becomes possible. For a joint channel estimation to work, a known reference or preamble signal is usually required. There is

no teaching or suggestion in Zhang of the details needed for the joint channel estimator to perform.

Consequently, Zhang does not teach, disclose, or suggest "performing on a corresponding complex composite base band received signal, comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, a joint detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection," recited in claim 1 because Zhang is silent on the aforementioned feature.

If the Examiner does not agree with Applicants' statement, Applicants respectfully request that the Examiner comply with 37 C.F.R. § 1.104(c)(2) and "designate as nearly as practicable" where Zhang discloses the aforementioned points. Otherwise, the rejection of claim 1 should be withdrawn.

The Examiner has cited Olsson to be teaching "determining at least one of the following: whether operation of the receiver is in a first mode in which an interfering signal is directed to a different receiver; and whether operation of the receiver is in a second mode in which a desired signal and an interfering signal are processed by the receiver" recited in claim 1. Applicants respectfully disagree because Olsson does not disclose "determining ... whether operation of the receiver is in a first mode in which an interfering signal is directed to a different receiver" as recited in claim 1.

Olsson does disclose selection of an interference rejection procedure suited for an impairment situation on hand. (¶0030 of Olsson). Olsson goes on to describe that an interference rejection method is applied in blind on at least a part of a received signal. If the result of the interference rejection is encouraging enough, it is concluded that the interference rejection was the appropriate one to apply. Otherwise another interference rejection approach is selected. (¶0032 of Olsson).

However, Olsson is silent on "determining ... whether operation of the receiver is in a first mode in which an interfering signal is directed to a different receiver" as recited in claim 1. If the Examiner does not agree with Applicants' statement, Applicants

respectfully request that the Examiner comply with 37 C.F.R. § 1.104(c)(2) and "designate as nearly as practicable" where Zhang discloses the aforementioned point or Olsson closes the gap in the teaching of Zhang. Otherwise, the rejection of claim 1 should be withdrawn.

Arguendo, even if Zhang and Olsson are considered together, in any manner of combination, the resulting combination would have unexpected results because (i) the combination would be unable to "perform[ing] on a corresponding complex composite base band received signal, comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, a joint detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection," and (ii) the combination would be incapable of "determining ... whether operation of the receiver is in a first mode in which an interfering signal is directed to a different receiver" as recited in claim 1.

Accordingly, Applicants respectfully submit that claim 1 is patentably unobvious over Zhang in view of Olsson. Therefore, the Examiner is requested to allow claim 1.

Regarding claim 42, as discussed above, Zhang does not teach, disclose, or suggest to "perform a joint detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection," and Olsson does not teach, disclose, or suggest to "determine ... whether operation of the receiver is in a first mode in which an interfering signal is directed to a different receiver" as recited in claim 42 reproduced below:

> 42. A device comprising:
> a receiver configured to be coupled to at least one receive antenna to receive transmissions sent from at least two spatially separated transmit antennas, the transmissions comprising a real modulation transmission and a complex modulation transmission, said receiver

> further configured to operate on a complex baseband received signal comprised of the real modulation and complex modulation received signals to perform a joint detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection of real and imaginary parts of the signals, said receiver yet further configured to determine at least one of the following:
>
> whether operation of the receiver is in a first mode in which an interfering signal is directed to a different receiver and
>
> whether operation of the receiver is in a second mode in which a desired signal and an interfering signal are processed by the receiver. (Emphases added).

Accordingly, Applicants respectfully submit that claim 42 is patentably unobvious over Zhang in view of Olsson and, therefore, in condition of allowance. The Examiner is requested to allow claim 42. Respective dependent claims 43-58 and 60 should be allowed at least for the reasons stated above.

B. Claims 18 and 19:

The Examiner has rejected claims 13-16, 18, 19, and 61 under 35 U.S.C. § 103(a) as being unpatentable over Olsson. The Applicants respectfully traverse the rejections.

As discussed above, Olsson does not teach, disclose or suggest to "perform on a corresponding complex composite base band received signal, comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, a joint detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection" as recited in claim 18 reproduced below:

> 18. A wireless transmission system comprising:
>
> at least one base station having at least two spatially separated antennas and at least one RF unit for transmitting one of a GMSK and an 8PSK transmission signal along each of said two spatially separated antennas;
>
> at least one receiving station, having at least one antenna, for communicating with said base station;
>
> where said receiving station comprises means for applying interference cancellation to a composite input signal comprising a combination of a first signal and a second signal interfering with said first signal, said receiving station configured to perform on a corresponding complex composite base band received signal, comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, a joint detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection of real and imaginary parts of signals, in which said receiving station comprises means for evaluating the modulation type of an interfering signal and for estimating channel parameters of said interfering signal;
>
> in which said channel parameters of said interfering signal are estimated by calculating channel parameters for all combinations of a desired signal and of said interfering signal and selecting the channel parameters that meet a criterion. (Emphasis added).

If the Examiner does not agree with Applicants' statement, Applicants respectfully request that the Examiner comply with 37 C.F.R. § 1.104(c)(2) and "designate as nearly as practicable" where Olsson discloses the aforementioned points. Otherwise, the rejection of claim 18 should be withdrawn.

Therefore, Applicants respectfully submit that claim 18 is patentably unobvious over Olsson. Accordingly, the Examiner is requested to allow claim 18, and respective dependent claims 13-16 and 61.

Further, Applicants submit that Olsson does not teach, disclose or suggest to "perform on a corresponding complex composite base band received signal, comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, a joint detection in inphase domain and quadrature domain

of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection" and "detecting ... whether said system is in a first transmission mode in which said interfering signal is directed to a different receiver" as recited in claim 19 reproduced below:

> 19. A wireless transmission system comprising:
> at least one base station having at least one antenna and at least one RF unit for transmitting one of a GMSK and an 8PSK transmission signal;
> at least one receiving station, having at least one antenna, for communicating with said base station;
> where said receiving station comprises means for applying interference cancellation to a composite input signal comprising a combination of a first signal and a second signal interfering with said first signal, said receiving station configured to perform on a corresponding complex composite base band received signal, comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, a joint detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection of real and imaginary parts of signals, in which said receiving station comprises means for evaluating the modulation type of an interfering signal and for estimating channel parameters of said interfering signal; and
> further comprising means for detecting at least one of the following:
> whether said system is in a first transmission mode in which said interfering signal is directed to a different receiver and
> whether said system is in a second transmission mode in which said first signal and said second signal are both to be processed \ by the receiving station; and processing said second signal in accordance with said detected transmission mode. (Emphases added).

If the Examiner does not agree with Applicants' statement, Applicants respectfully request that the Examiner comply with 37 C.F.R. § 1.104(c)(2) and

"designate as nearly as practicable" where Olsson discloses the aforementioned points. Otherwise, the rejection of claim 19 should be withdrawn.

Therefore, Applicants respectfully submit that claim 19 is patentably unobvious over Olsson. Accordingly, the Examiner is requested to allow claim 19.

C. Claims 62 and 63:

The Examiner has rejected claims 62 and 63 under 35 U.S.C. § 103(a) as being unpatentable over Zhang in view of Olsson and further in view of Hafeez *et al.* of record. The Applicants respectfully traverse the rejections because the combination does not disclose the features emphasized below:

> 62. A method, comprising:
>
> receiving a wireless communication signal by a receiver from each of at least two spatially separated transmit antennas associated with at least one transmitter or from at least two transmitters;
>
> performing on a corresponding complex composite base band received signal, comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, a joint detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection of real and imaginary parts of signals, from a single receive antenna branch or from a plurality of receive antenna branches; and
>
> sequentially estimating desired and dominant interfering signal channel impulse responses, where channel estimation blindly identifies a dominant interferer modulation type and its training sequence, where modulation identification comprises use of $e^{j\pi k/2}$, $e^{j3\pi k/8}$ constellation rotations associated with GMSK and 8PSK modulations, respectively, and where training sequence identification comprises use of an estimation metric over a plurality of possible interference training sequence pairs. (Emphasis added).

63. (Currently Amended) A device comprising:

a receiver configured to be coupled to at least one receive antenna to receive transmissions sent from at least two spatially separated transmit antennas, the transmissions comprising a real modulation transmission and a complex modulation transmission,

said receiver further configured to operate on a complex baseband received signal comprised of the real modulation and complex modulation received signals to perform a joint detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection of real and imaginary parts of the signals,

said receiver yet further configured to sequentially estimate desired and dominant interfering signal channel impulse responses, where channel estimation blindly identifies a dominant interferer modulation type and its training sequence, where

modulation identification comprises use of $e^{j\pi k/2}$, $e^{j3\pi k/8}$ constellation rotations associated with GMSK and 8PSK modulations, respectively, and where

training sequence identification comprises use of an estimation metric over a plurality of possible interference training sequence pairs. (Emphasis added).

Hafeez has been cited to describe the impact of training sequences on the joint demodulator performance and that the channel error estimation depends on the number of channel taps. However, neither Olsson nor Hafeez, considered in any combination thereof, do not bridge the significant gap left by Zhang because just as Zhang is, Hafeez and Olsson are silent on "performing on a corresponding complex composite base band received signal, comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, a joint detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection" recited in claim 62 and "operate on a complex baseband received signal comprised of the real modulation and complex modulation received signals to perform a joint

detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection" recited in claim 63.

If the Examiner does not agree with Applicants' statement, Applicants respectfully request that the Examiner comply with 37 C.F.R. § 1.104(c)(2) and "designate as nearly as practicable" where Zhang discloses the aforementioned points or where Olsson and Hafeez close the gap in the teaching of Zhang. Otherwise, the rejection of claims 62 and 63 should be withdrawn.

Applicants request that claims 62 and 63 be allowed as these claims are patentably unobvious over Zhang in view of Olsson and further in view of Hafeez *et al.* of record.

D. New Claims 64 and 65:

Claims 64 and 65 are directed to a computer-readable storage medium having computer-executable instructions for features of independent method claims which are patentably unobvious over the cited art as discussed above. Accordingly, claims 64 and 65 are in condition of allowance and the Examiner is requested to allow claims 64 and 65.

CONCLUSION

For the foregoing reasons, the Applicants believe that each and every issue raised by the Examiner has been adequately addressed and that this application is in condition for allowance.

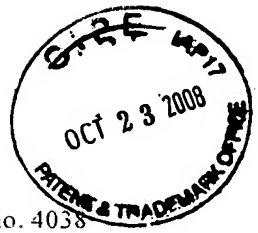
The Patent Office is respectfully requested to reconsider and remove the rejections of the claims under 35 U.S.C. § 103(a) based over various combinations of Zhang, Olsson, and Hafeez, and to allow all of the pending claims as now presented for examination. An early notification of the allowability of the pending claims is earnestly solicited.

Respectfully submitted:

Oct 20, 2008
Date

Jerry Stanton
Reg. No.: 46,008

Customer No.: **29683**
HARRINGTON & SMITH, PC
4 Research Drive
Shelton, CT 06484-6212
Telephone: (203) 925-9400
Facsimile: (203) 944-0245
email: gstanton@hspatent.com



CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. BOX 1450, Alexandria, VA 22313-1450.

October 20, 2008
Date

Name of Person Making Deposit